THE EXPEDITION OF THE MOUNT WILSON OBSERVATORY TO THE SOLAR ECLIPSE OF JUNE 8, 1918.

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The apparatus of the Mount Wilson Observatory expedition at Green River, Wyoming, consisted of:

1. Littrow Plane Grating Spectrograph. Observers: Adams, St. John and Brackett.
2. Corona Rotation Prism Spectrograph. Observers: Adams and Ellerman.
3. Objective Grating Spectrograph. Observers: Anderson and Babcock.
4. Objective Prism Polarizing Spectrographic Camera: Anderson and Babcock.
5. Eight inch thirty-foot Photoheliograph Camera: Mr. Ellerman.
6. Small Silvered Quartz Lens Camera: Miss Margaret Hale.

Light was supplied to all of these except (3) and (6) from the thirty-inch cœlostat mirror of the Snow telescope. (3) was fed from a small speculum mirror mounted on the cœlostat axis, while (6) was simply pointed directly at the sun, and the image allowed to drift.

The general arrangement is shown in the plan sketch (Slide 1). The beam of light from the cœlostat mirror is directed horizontally westward; the lower central portion falls on the eight-inch photoheliograph lens, the portion immediately north of this serving to fill the two-inch lens of the polarizing spectrograph camera. The upper central portion falls on the six-inch image-forming lens of the corona rotation spectrograph, while the considerable portion left of the south half of the beam sufficiently fills the concave mirror which forms the image used by the Littrow Plane Grating Spectrograph. This spectrograph was located east of the cœlostat, and

the axis of the concave mirror was inclined to the south and upwards sufficiently to allow the beam to clear the cœlostat mounting, the angle being a matter of about 3°.

This arrangement which is unusually compact even for eclipse work was found to work very satisfactorily indeed, and on account of its compactness it was a simple matter to protect all the instruments from the heat of the sun, as well as from vibration due to the wind.

The Littrow spectrograph consisted a 6-inch aperture, 18-foot focus lens, and a plane grating having a ruled surface of 4×6 inches, 15,000 lines per inch, one first order being extremely bright. The dispersion was about 3.4 A.U. per millimeter, which was judged sufficient for accurate wave-length determinations. The diameter of the moon's image formed by the projection mirror was about three inches, and this image was placed just tangent to the slit, the point of tangency being nearly coincident with the position of second contact. During mid-totality, the whole spectrograph was moved parallel to itself a distance of three inches so that during the last half of totality the slit was tangent to the moon's limb at or near the point of third contact. An auxiliary 90° prism and observing eyepiece enabled one of the observers to watch directly the region of the spectrum including D_3 for purposes of accurate guiding. Two small right-angled prisms placed over the slit allowed on iron arc comparison spectrum to be impressed on each plate simultaneously with the exposure on the sun. The exposures were six in number, three made during the total phase and three before and after, in order to get accurate wave-lengths extremely close to the sun's limb.

The corona rotation spectrograph was a three-prism Littrow type, using a lens of forty-inch focus, the dispersion at λ 5300 being about six A.U. per millimeter. Only that portion of the spectrum in the immediate vicinity of the green coronal line was photographed, the slit being parallel to the sun's equator. An iron arc comparison spectrum was impressed immediately before totality so as to permit an accurate determination of the wave-length of the green line.

The objective grating spectrograph used a six-inch Rowland

concave grating of twenty-one-foot radius of curvature, and was of exactly the same type as has been used at various eclipse observations before. One improvement in the method of observation needs, however, to be noted: Ordinarily the spectrograph is adjusted with the axis of the incident beam pointing to the center of the sun. For a station near the center line of the eclipse track the direction of the incident light at second and third contacts, make angles of $\pm 15'$ with this direction, which alters the focus of a grating such as was employed here by a quantity of the order of one millimeter. In the present case the speculum mirror being adjusted to the center of the sun before totality was rotated eastward through an angle of seven and one half minutes for the exposures at second contact; then back to the original position for the exposure at mid-totality; then westward seven and one half minutes for the remaining exposures at third contact.

The objective prism polarizing spectrograph consisted of an ordinary 4×5 view camera having a two-inch aperture, eight-inch focus Planar lens, in front of which was placed in order a direct vision prism and a Rochon double image prism. Two objective prism spectra are thus obtained, the planes of polarization being at right angles to each other.

The silvered quartz lens camera was used simply to obtain data in regard to exposure time and relative aperture required for use at future eclipses. As is well known a silver film opaque to visible radiation is quite transparent from about $\lambda 3200$ to $\lambda 3100$. Used on a quartz lens it is hence possible to obtain fairly monochromatic images in this part of the ultra-violet spectrum. In the present case the aperture was about F/12, the exposure time through clouds with an estimated transparency of 10 per cent., about ninety seconds, and yet a great deal of coronal structure is well shown on the plate obtained. Hence it should be easy to obtain good photographs in this way when conditions are right.

On the day of the eclipse a large cloud obscured the sun from a few minutes after first contact until a few minutes after third contact. During totality the sun was visible through an irregular thinner portion of the cloud, but it is doubtful if the intensity of the

light was more than 10 per cent. of normal. However, the program was carried through as planned.

The photographs obtained with the photoheliograph were fairly good as may be seen from the slides (2 and 3). The plates taken with the Littrow plane grating spectrograph were too weak to be of value, as was also the case with those obtained with the objective grating spectrograph. The latter shown about a dozen of the ultra-violet hydrogen lines, and the prominences in the stronger hydrogen lines and in H and K show well. The irregular prominence shown on slide 2 shows some distortion due probably to motion in the line of sight.

The plate taken with the corona rotation spectrograph shows the coronal line only at the east limb, hence the rotation cannot be determined. The wave-length at E limb neglecting the rotation comes out equal to 5303.022 I. A.

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